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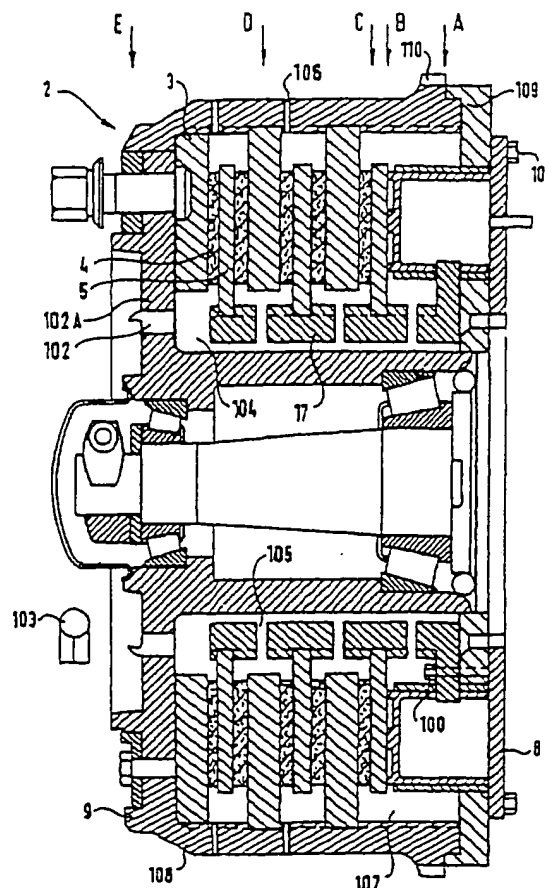
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: <b>PCT/SE96/01570</b></p> <p>(22) International Filing Date: <b>29 November 1996 (29.11.96)</b></p> <p>(30) Priority Data: <b>9504286-7</b>      <b>29 November 1995 (29.11.95)</b>      <b>SE</b></p> <p>(71) Applicant (for all designated States except US): <b>K.S. TECHNOLOGY HB [SE/SE]; Gånggriftsvägen 4, S-471 94 Källekärn (SE).</b></p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): <b>KARLSSON, Gerth [SE/SE]; Gånggriftsvägen 4, S-471 94 Källekärn (SE). SUNDQVIST, Bengt [SE/SE]; Ekbacken 5, S-440 92 Svanesund (SE).</b></p> <p>(74) Agent: <b>CEGUMARK AB; P.O. Box 53047, S-400 14 Göteborg (SE).</b></p>	<p>(81) Designated States: <b>AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</b></p> <p><b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> <i>In English translation (filed in Swedish).</i></p>	

(54) Title: **BRAKE DEVICE**

## (57) Abstract

The present invention relates to a brake device comprising a number of brake discs, brake pads and brake pad holders being arranged for mutual co-operation after axial operation by means of actuators for braking. The brake pads are being carried by the brake pad holders (5) that are connected to a first frame member. Ring shaped brake discs are carried by a second frame member. Brake pad holders and brake discs are axially displaceable journaled relative to each other. The two frame members are arranged to be braked relative to each other after actuation of axially acting actuators. In order to provide efficient cooling of the parts that comprises the brake, there are a number of passages (102) provided in the brake drum (102A) for leading air internally (104) to the brake system when the drum and the wheel rotates in the direction of travel.



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Title:

Brake device

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The present invention relates to a brake device comprising a number of brake discs, brake pads and brake pad holders being arranged for mutual co-operation after axial operation by means of actuators for braking, the brake pads being carried by the  
10 brake pad holders that are connected to a first frame member, ring shaped brake discs are carried by a second frame member, brake pad holders and brake discs being axially displaceable journaled relative to each other, wherein the two frame members are arranged to be braked relative to each other after actuation  
15 of axially acting actuators.

Brakes for vehicles are usually categorised into drum brakes and disc brakes. Disc brakes are the most common brakes on passenger vehicles, due to their efficiency and flexibility, while drum  
20 brakes are more usually used on trucks and busses, thanks to their ability for large scaling, i.e. that the brakes may be designed with large dimensions, e.g. for the purpose of cooling and for good braking.

25 The primary object of the present invention, is to provide a brake device according to the introductory part of claim 1, where the braking performance and the cooling performance are unchanged in spite of the small dimensions and the safe function of the brake.

30

Said objects are achieved with a device in accordance with the present invention which is principally characterized in that there are a number of passages/openings provided in the frame member/brake housing of the brake for leading air internally to the brake and thereby providing air cooling of comprised brake parts.

The invention will in the following be further described as a number of preferred embodiments with reference to the accompanying drawings, in which:

- Fig. 1 is a cross sectional view of a brake in an active breaking condition,
- Fig. 2 shows in a plane view the brake device with different parts in section,
- Fig. 3 shows another embodiment of a brake with cooling, shown in cross section,
- Fig. 4 shows in a plane view said brake in section along different section lines in Fig. 3, and
- Fig. 5 shows different views of ventilation openings for a brake housing.

A device 1 for a brake 2 which is primarily intended for use with vehicles like busses, trucks, lorries etc., but may also be used for other purposes, and comprising a number of brake discs 3, brake pads 4, and brake pad holders 5 that are adapted to cooperate with each other after axial 6 actuation of the brake 2 by means of actuator means 7 for braking, with said comprised parts being arranged in a special way.

To be precise, the brake pads 4 are carried by the brake pad holder 5, which is connected to a first frame member 8.

Moreover, ring shaped brake discs 3 are carried by a second frame member 9. In order to allow for self adjustment of the active brake parts 3; 4, 5, said brake pad holders 5 along with the there upon carried brake pads 4, and brake discs 3 are axially displaceable journalled 10 relative to each other. For this object, the two frame members 8, 9 are adapted to be braked relative to each other after actuation of axially acting actuators 7.

One of said two frame members 8, 9 is formed by a vehicle chassis 8, and the second frame member is formed by a rotatable drum 9 onto which for example a vehicle wheel is arranged to be attached efficiently and secure by means of wheel bolts 11 according to art and not disclosed in detail. The brake discs 3, the number of which may vary from a single up to a large number depending upon space and breaking performance, are preferably connected to the drum 9. They are for this object received by the drum 9 with their respective outer circumference part 12 of the brake discs 3 in a number of axially running grooves 13.

Preferably, there are several grooves 13 in the form of splines distributed correspondingly along the external mantle surface 16 of the brake discs.

Moreover, there are disc shaped brake pad holders 5 mounted on a hub shaped centre part 17 upon the respective frame member 8 non-rotatable connected relative to said centre part 17. Said brake pad holders 5 are ring shaped and are axially displaceable journalled with internal splines 18 received in external splines 19 on the centre part 17, in the axial direction 10.

Said hub shaped centre part 17 is formed by a cylinder, the end part 20 of which is rigidly connected by means of a flange 21 to an inner, non-rotatable connected rotatable frame disc into the centre opening 23 of which a bearing 4 for the frame members 8, 9 reaches and which bearing is used in a central cavity 25.

Preferably, brake pads 4 are shaped as rings or are composed by a number of segments of brake pad material together forming a ring. Preferably, said brake pads 4 are made of an asbestos free material that is carried mounted at each side 26, 27 of the respective brake pad holder 5.

The brake pad holder 3 being located nearest the actuator means 7 lacks brake pad material along the flat side 27 which is turned towards it by reasons that will be easily understood.

Said actuator means 7 comprise at least one jack which is adapted to operate by means of a suitable fluid, preferably pneumatic. For example, there may be arranged a plurality of equally around the circumference of the brake 2 distributed jacks.

In the disclosed embodiment, the jack is formed by a single ring shaped piston 7, one end 28 of which is acting against a frame member 8, and which is acting with the other end 29 against the formed aggregate 30 of brake pads 4, brake pad holder 5 and brake discs 3 in order to provide compression in the force direction 6 against an opposed frame member 9, namely the internal gable wall 31 of the drum.

A correspondingly designed brake 2 is arranged to function efficiently. As an example may be mentioned that the operative braking surface for the brake pads 4 is doubled in comparison with conventional drum brakes of a corresponding size, which ought to explain the efficiency of the present brake which is about three times better.

The assembly of the parts that comprise the brake 2 is also simple to execute.

10

In the brake 2 which is shown in Fig. 3-4 there are three ring shaped brake discs 3 which are ventilated and which also may move axially, carried by the enveloping brake drum 9. There are three disc shaped brake pad holders 5, with brake pads 4 for example attached by gluing along at least one of the flat sides. Said brake pad holders 5 are also axially displaceable journalled independent from each other on a tube shaped centre part 17 which is attached by means of screws 100 in the frame member which functions as a brake shield 8.

20

The disclosed embodiment comprises a plurality of pistons 7 that are equally distributed around the circumference and are attached to the brake shield 8 by means of screws 101. The function of these actuator means 7 is also to compress the brake discs 3 and the pads 4 when for example the pneumatic pressure increases for providing braking. Since the brake 2 is self adjusting, breaking will be provided instantly without any substantial delay.

30

In order to provide an efficient cooling of the parts that comprises the brake there are a plurality of passages 102 in the



front side 102A of the brake drum and there is attached a pre-shaped bent metal sheet or piece of plastic 3. This piece 103 is turned or manufactured in some other way with the desired angle depending upon which side of the vehicle that the brake 2 is mounted for pressing air into the inside 104 of the brake system when the brake drum and the wheel is rotating in the direction of travel. In said centre part 17, which retains the brake pad holders 5 and the brake pads 4, there are arranged preferably radial through channels or holes 105 enabling for entering air to pass through the ventilated brake discs 3, for example via radial channels 107 and flow upward and out to the environment via further holes 106 which are arranged in the surrounding mantle shaped outer shell 108 of the drum.

15 Dirt and other undesirable matter is pressed out from the brake 2 by the action of the centrifugal force.

A ring 110 may be pressed onto the rear edge 109 of the brake drum 2 which ring is provided with irregularities 111 for creating a vacuum between the brake drum 9 and the wheel rim, thereby providing a more efficient air cooling.

For example, two of said pistons 7 may be arranged to be actuated by a so called maxibrake, for providing a prior art hand brake.

The embodiment shown in Fig. 5 clearly illustrates an example of how a plurality of ventilation openings 206 are arranged distributed along the brake housing 250 in which the movable parts of the brake are housed protected. Preferably, said ventilation openings 206 are manufactured by punching from the

inside 251 of the brake housing. By this, a baffle wall 252 or an edge is formed at the opening 206 which is directed with its opening turned toward the direction of rotation 253 of the brake housing 250. When driving the vehicle and the wheels, the brake housing 250 of each wheel is rotating and air L is pressed in through the formed opening 206 by means of said baffle wall or scoop shaped means 252 for controlling air flow, wherein an efficient flow of air to the insides 251 of the brake is achieved.

10

The invention is not limited to the above described and in the drawings shown embodiments of the brake device but may be varied within the scope of the claims without leaving the scope of the invention.

15

## CLAIMS

1. Brake (2) device (1) comprising a number of brake discs  
5 (3), brake pads (4) and brake pad holders (5) being arranged for  
mutual co-operation after axial (6) operation by means of  
actuators (7) for braking, the brake pads (4) are carried by the  
brake pad holders (5) that are connected to a first frame member  
(8), ring shaped brake discs (3) are carried by a second frame  
10 member (9), brake pad holders (5) and brake discs (3) being  
axially displaceable (10) journalled relative to each other,  
wherein the two frame members (8, 9) are arranged to be braked  
relative to each other after actuation of axially acting  
actuators (7), c h a r a c t e r i z e d in that there are a  
15 number of passages (102)/openings (206) provided in the frame  
member (8)/brake housing (250) of the brake for leading air  
internally to the brake and thereby providing air cooling of  
comprised brake parts.

20 2. Brake device according to claim 1, wherein one of said frame  
members (8, 9) is formed by a vehicle chassis (8) and the other  
frame member is formed by a rotatable brake drum (9),  
c h a r a c t e r i z e d in that the brake discs (3) are  
connected to the drum (9) received with their respective outer  
25 circumference part (12) in axially running grooves (13).

3. Brake device according to claim 2,  
c h a r a c t e r i z e d in that several grooves (13  
respectively 15) formed as splines are distributed along the  
30 internal envelope surface (14) of the drum (9) respectively the  
external mantle surface (16) of the brake discs (3).

4. Brake device according to any one of claims 1-3,  
c h a r a c t e r i z e d in that the disc shaped brake pad  
holders (5) are mounted on a hub shaped centre part (17) upon  
the respective frame member (6) non-rotatable connected relative  
5 to said centre part (17).
5. Brake device according to claim 4,  
c h a r a c t e r i z e d in that the brake pad holders (5) are  
ring shaped and are axially displaceable journalled with  
10 internal splines (18) received in external splines (19) on the  
centre part (17).
6. Brake device according to any of claims 4-5,  
c h a r a c t e r i z e d in that the hub shaped centre part  
15 (17) is formed by a cylinder, the end part (20) of which is  
connected by means of a flange (21) to an inner, relative to the  
drum, rotatable frame disc (22).
7. Brake device according to any of the above claims,  
20 c h a r a c t e r i z e d in that the brake pads (4) are shaped  
as rings or are composed by segments together forming a ring.
8. Brake device according to claim 7,  
c h a r a c t e r i z e d in that the brake pads (4) are being  
25 carried mounted at each side (26, 27) of the respective brake  
pad holder (5).
9. Brake device according to any one of claims 1-8,  
c h a r a c t e r i z e d in that the actuators comprise at  
30 least one fluid operated jack (7).

10. Brake device according to claim 9,

c h a r a c t e r i z e d in that the jack comprises a ring shaped piston, one end (28) of which is acting against a frame member (8), and which is acting with the other end (29) against the formed aggregate (30) of brake pads (4), brake pad holders (5) and brake discs (3) for compression against a frame member (9).

11. Brake device according to any one of the above claims,

c h a r a c t e r i z e d in that at said passages (102)/openings (206) are arranged means (103; 252) adapted for pressing air in through the related passages (102; 206).

12. Brake device according to claim 11,

c h a r a c t e r i z e d in that a pre-shaped bent metal sheet or piece of plastic (103), which is turned or manufactured in some other way with the desired angle depending upon which side of the vehicle that the brake (2) is mounted, for pressing air into the inside (104) of the brake system when the brake drum and the wheel is rotating in the direction of travel, are present at the respective passage (102) at the front (102A) of the brake drum.

13. Brake device according to claim 11,

c h a r a c t e r i z e d in that a number of ventilation openings (206) are arranged distributed along the brake housing (250) in which the movable parts of the brake are housed.

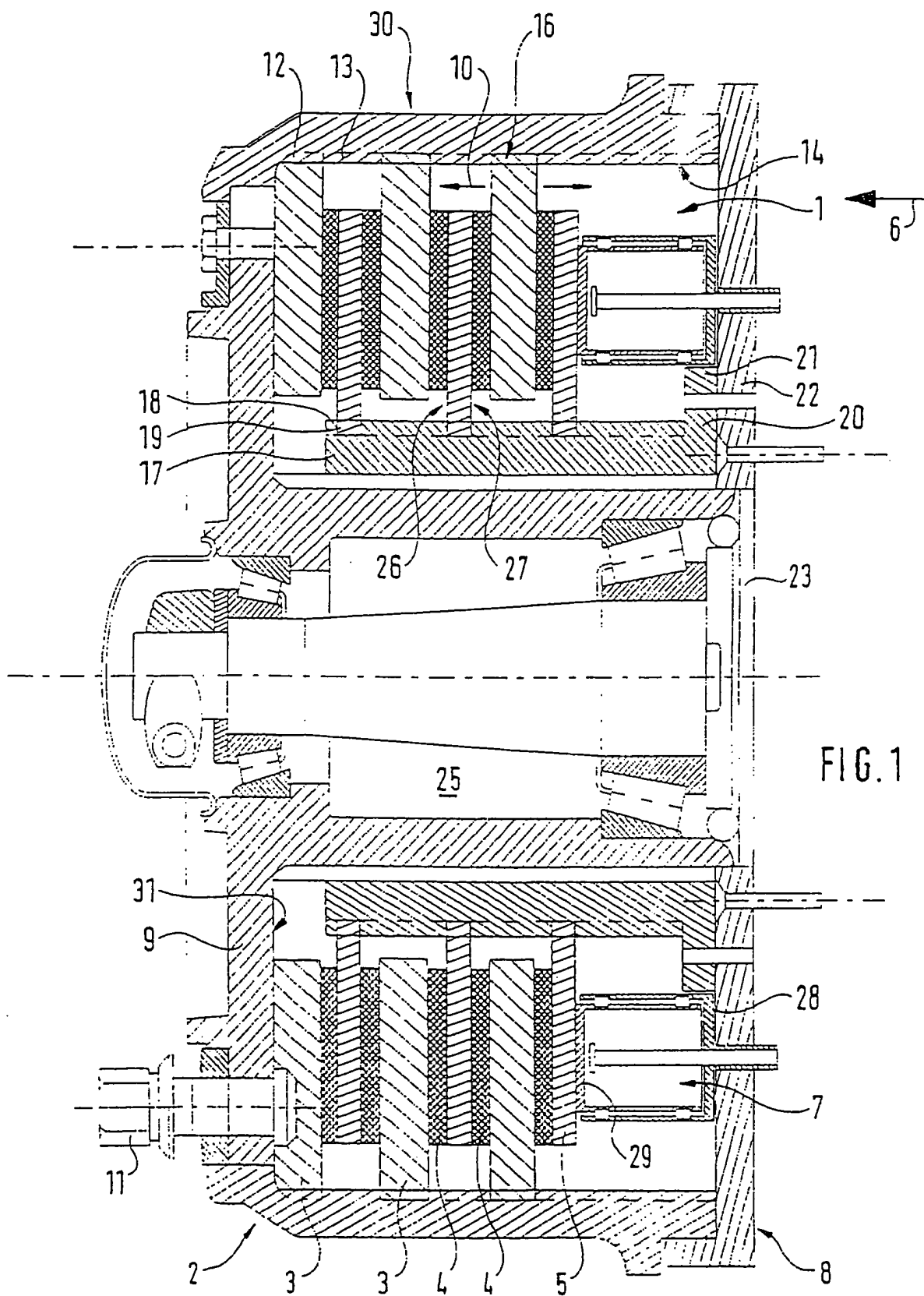
14. Brake device according to claim 13,

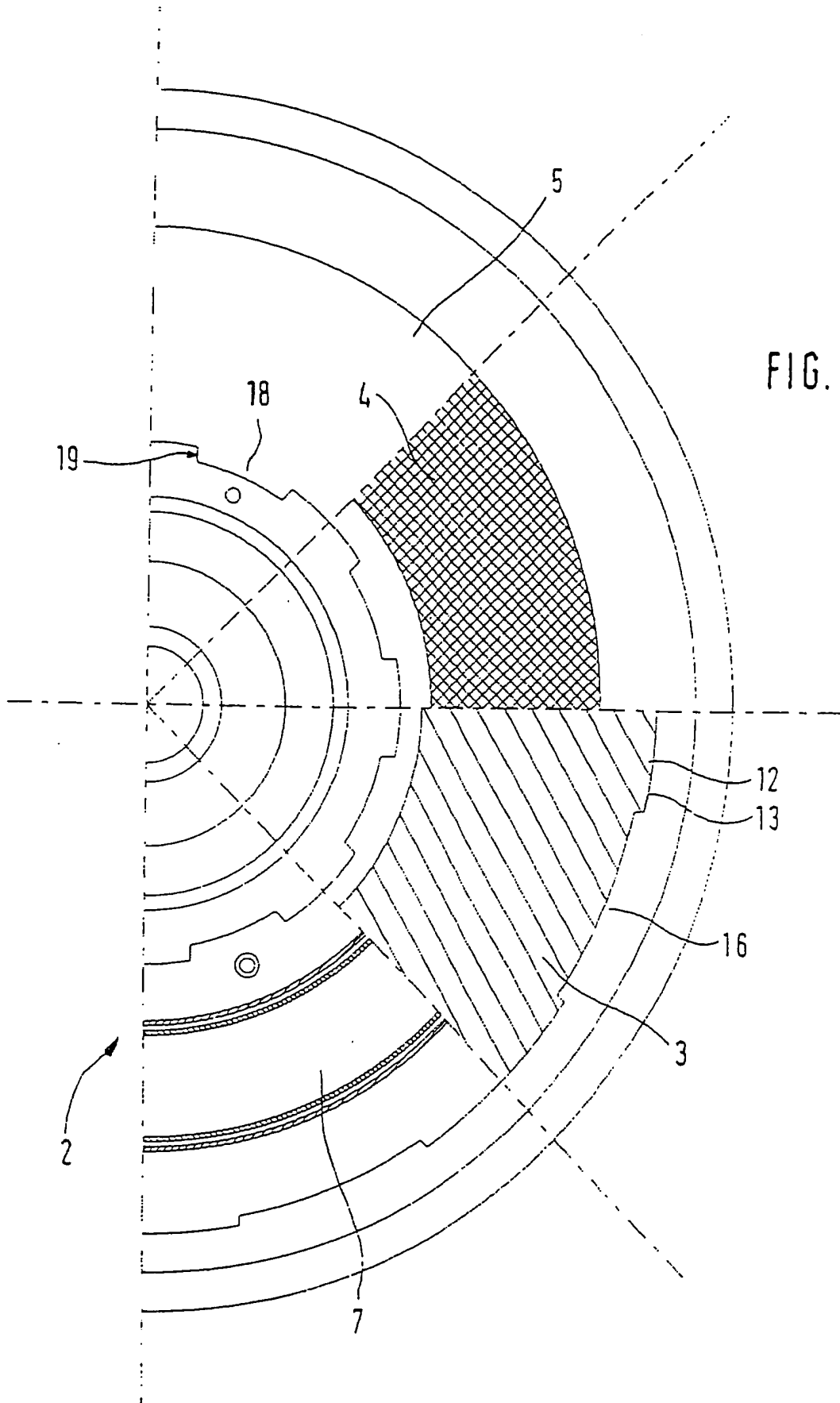
c h a r a c t e r i z e d in that said ventilation openings (206) are manufactured by punching from the inside (251) of the

brake housing whereby a baffle wall (252) or an edge is formed at the respective opening (206) for directing air (L) through said opening.

- 5 15. Brake device according to any one of claims 1-14,  
c h a r a c t e r i z e d in that a ring (110) is pressed onto  
the rear edge (109) of the brake drum (2) which ring is provided  
with irregularities (111) for creating a vacuum between the  
brake drum (9) and wheel rim, thereby creating a more efficient  
10 air cooling.

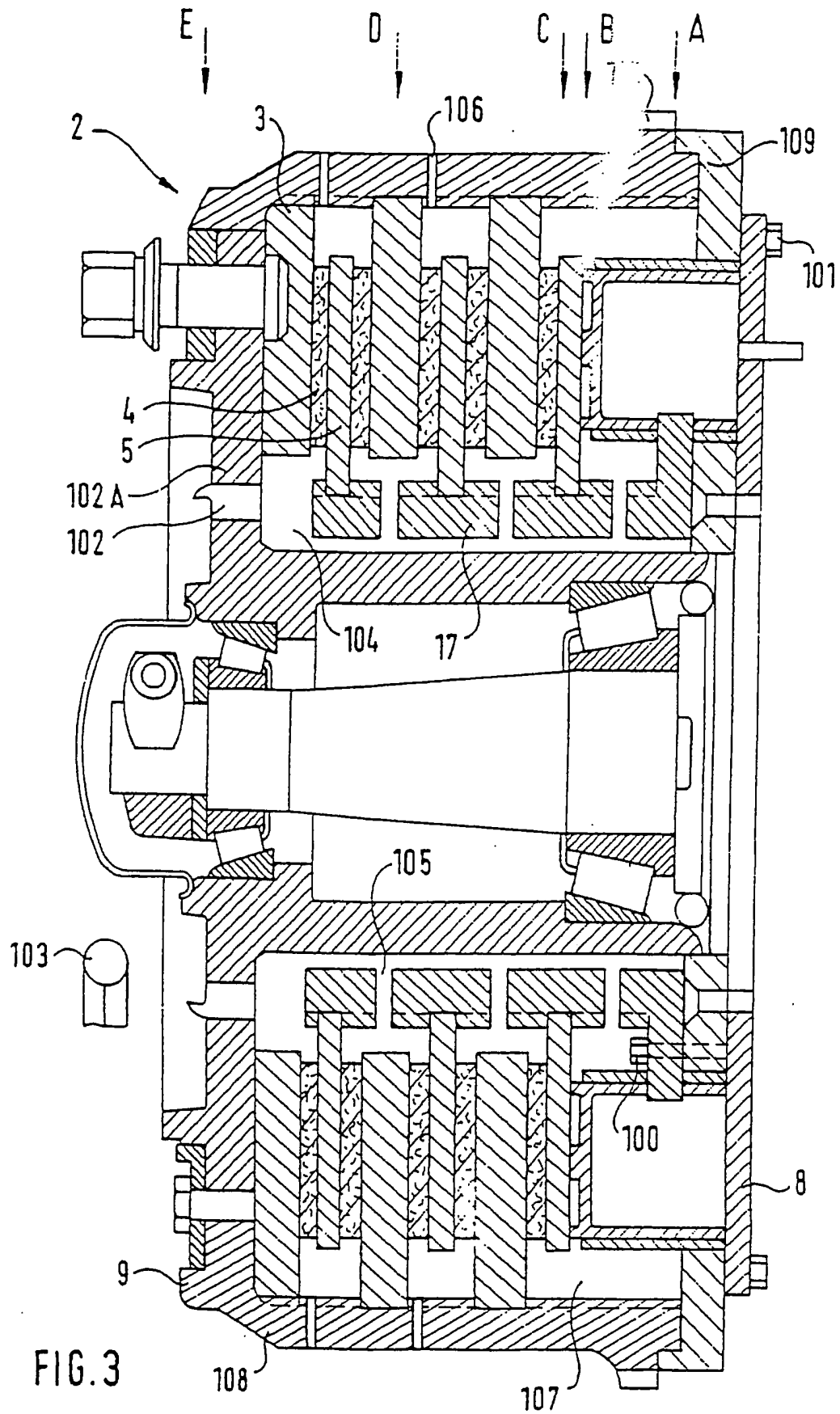
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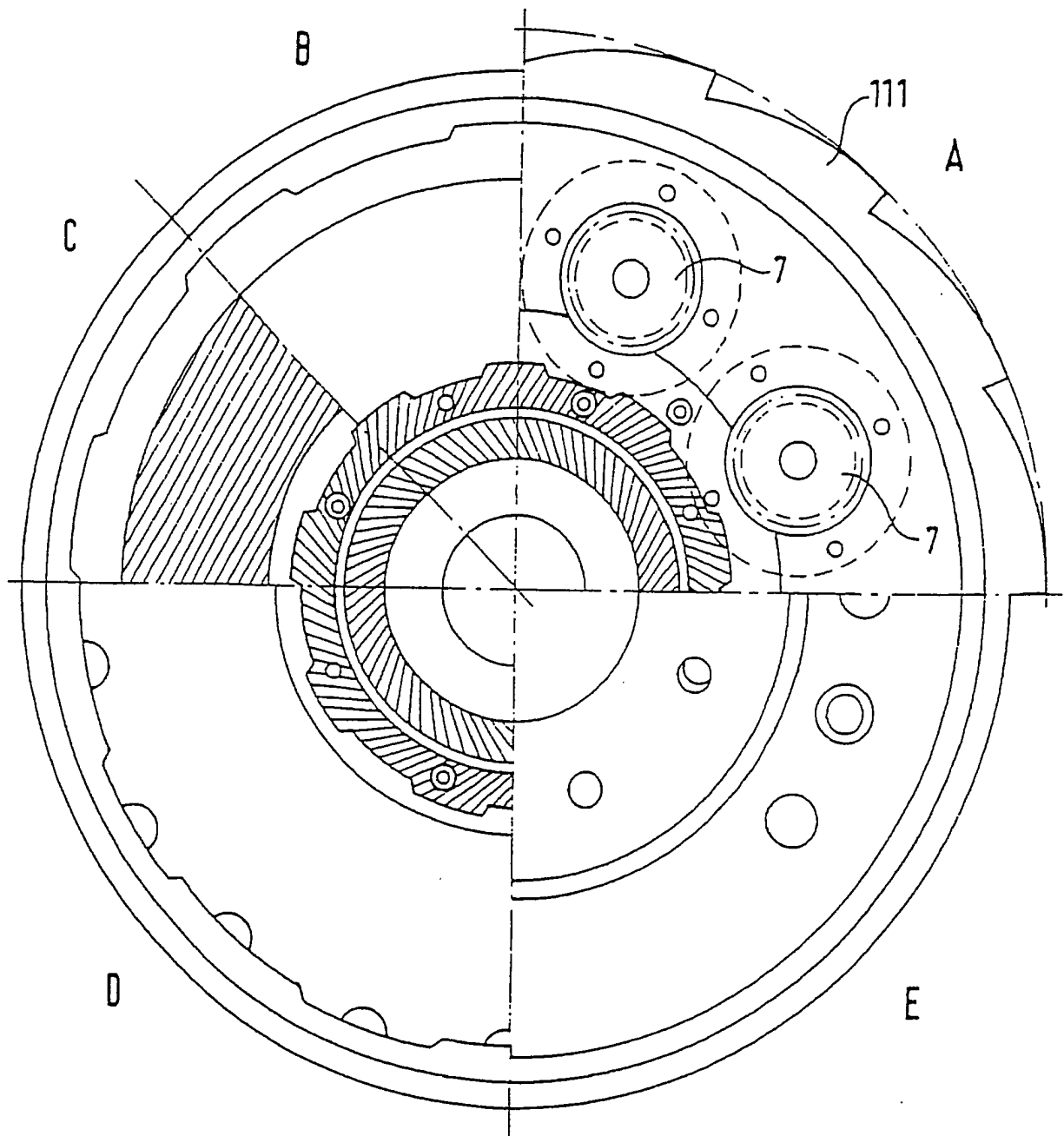
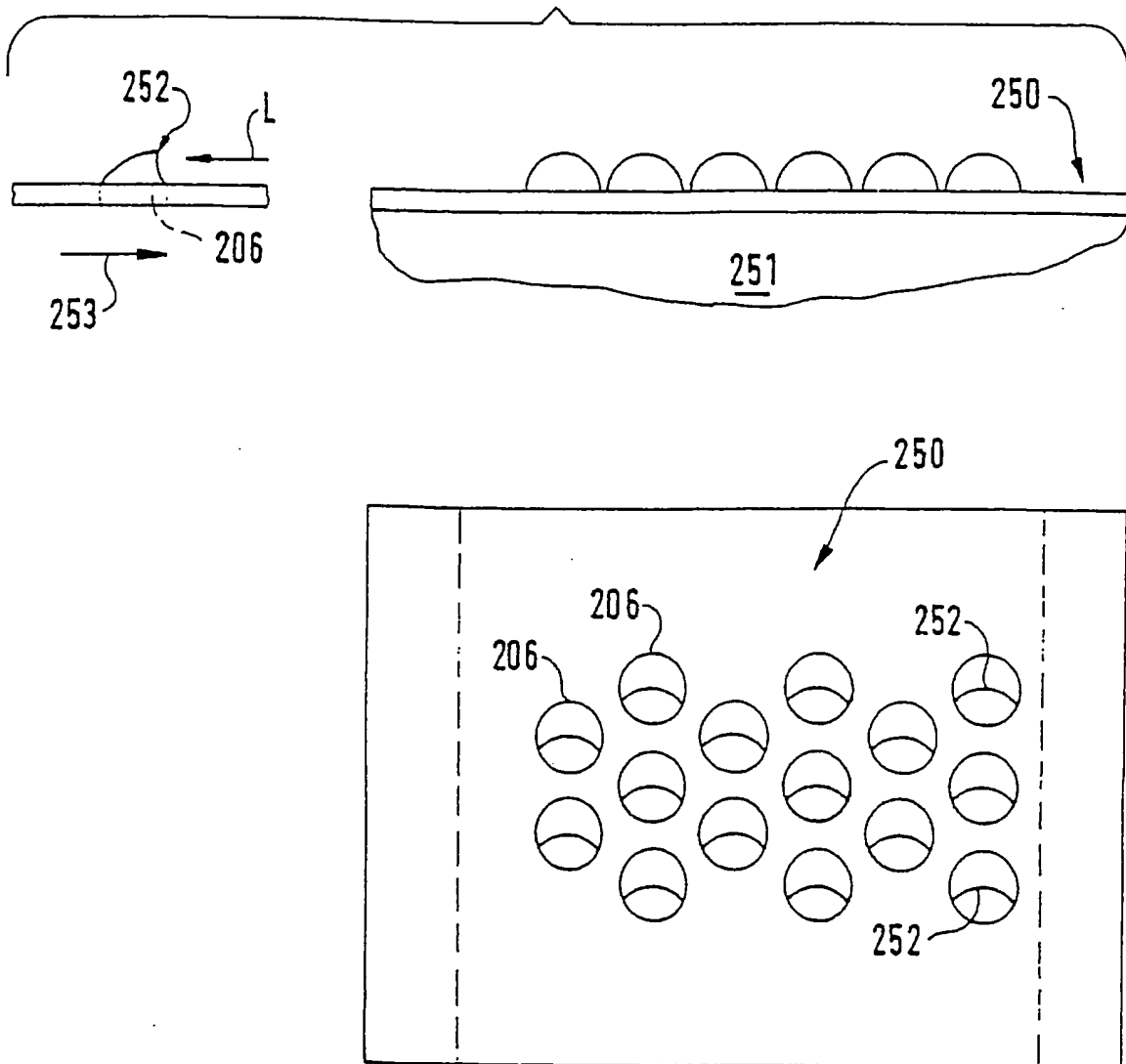


FIG. 4

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FIG. 5



## INTERNATIONAL SEARCH REPORT

Inter. appl. No.

PCT/SE 96/01570

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F16D 55/42, F16D 65/847

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F16D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3862678 A (COLLINS), 28 January 1975 (28.01.75), column 3, line 8 - column 4, line 47, figure 2, abstract --	1-15
Y	SE 379235 B (T C MARTIN), 29 Sept 1975 (29.09.75), page 6, line 40 - page 7, line 5, figure 3 --	1-15
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

03/02/97

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